

# On Orbit Validation and Calibration of Ocean Color Sensors with Underflights of the NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS)

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# OVERVIEW

- Objective and Justification
- Approach
- Current Results
- Future Plans
- Discussion

# Objective and Justification

- **OBJECTIVE:**
  - Calibrate and Validate the On Orbit Radiometric Characteristics of SeaWiFs with Underflights of NASA's Calibrated Airborne Visible/Infrared Imaging Spectrometer (AVIRIS)
- **JUSTIFICATION:**
  - Calibration is essential for the quantitative use of SeaWiFs data
  - Calibration in the laboratory of spaceborne sensors is challenging
  - Satellite sensors are subjected to trauma during launch
  - The Earth orbit environment is different the laboratory calibration environment
  - Through years of effort AVIRIS is demonstrated to be well calibration
  - AVIRIS can match the spectral and spatial observation characteristics of SeaWiFs

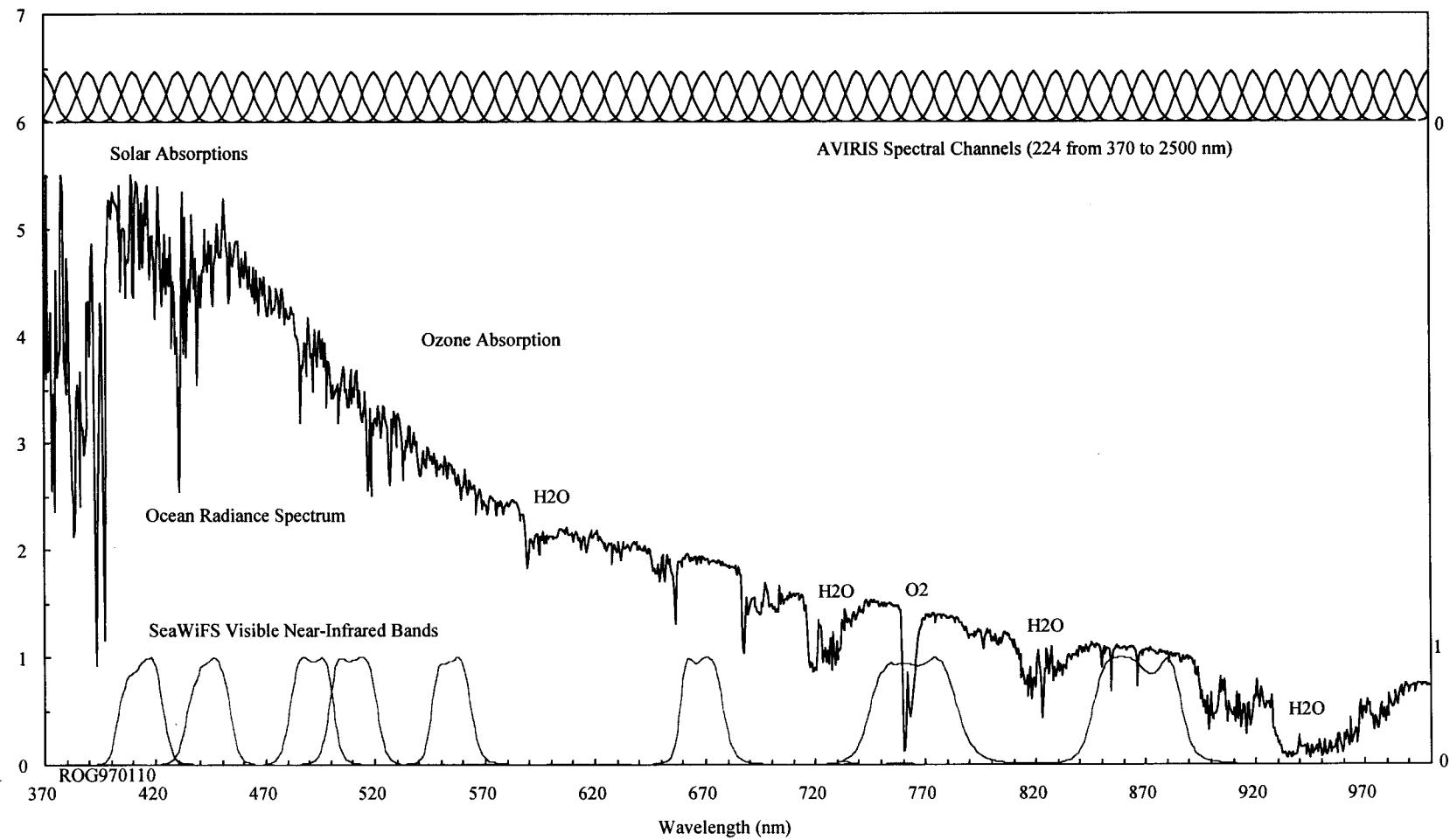
# Approach

- Determine the calibration accuracy of AVIRIS with high confidence
- Underfly SEAWIFS with AVIRIS matching observation geometry
  - Issues: weather, satellite, aircraft, sensor, location
- Correct AVIRIS spectral image data to the top of the atmosphere
- Convolve AVIRIS spectral channels to SEAWIFS bands
- Determine and extract water with correct observation geometry
- Compare, analyze, repeat for monitoring

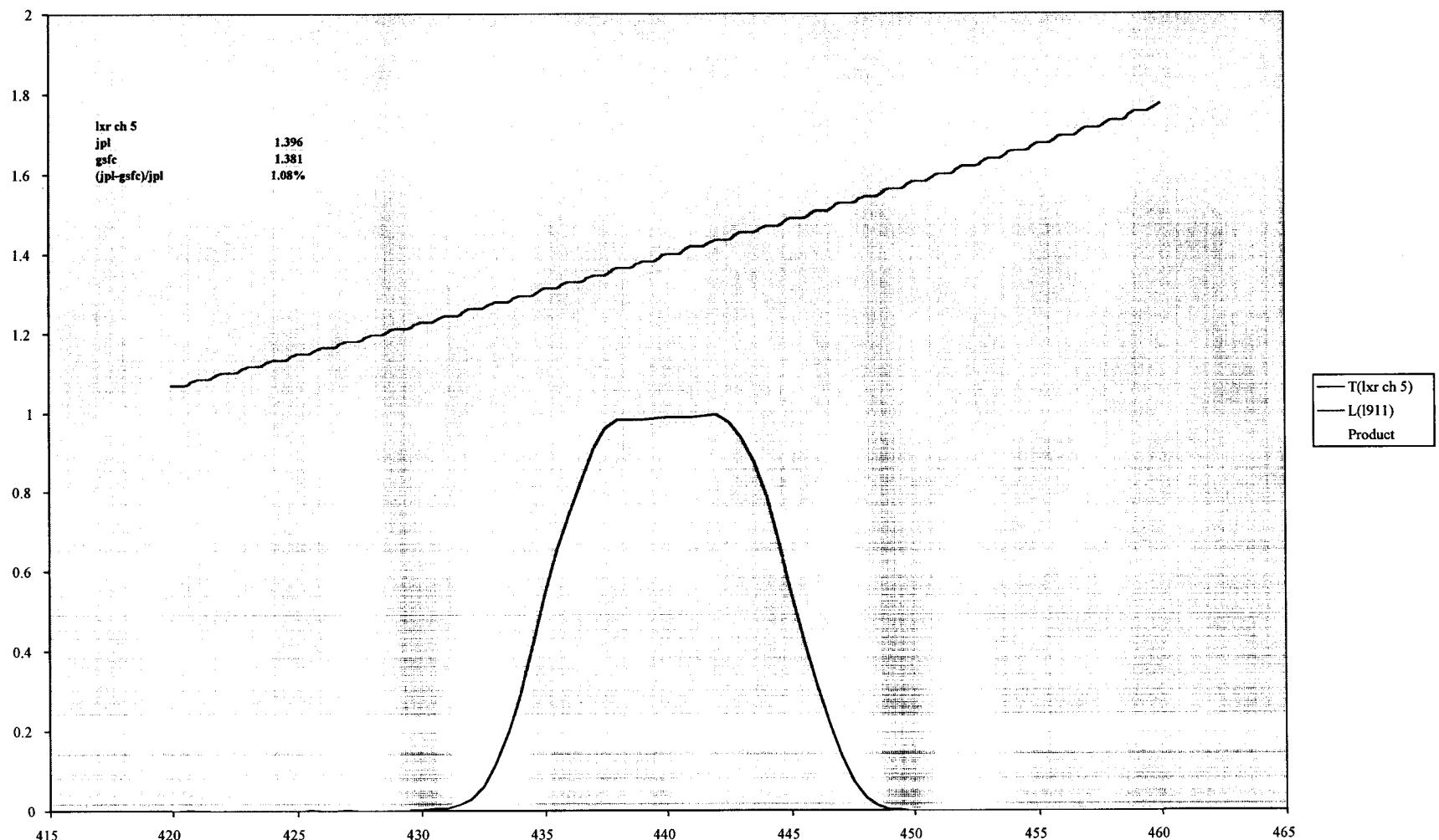
# Activities

- SXR radiometric comparison Spring
- AVIRIS data set for Carder May
- SEAWIFS Underflight Green May
- SXR radiometric comparison Summer
- LXR radiometric comparison Summer
- SEAWIFS Underflight 990807
- SEAWIFS Underflight 990912
- CALCOFI overflight October
- SEAWIF Underflight October
- Analysis and Reporting

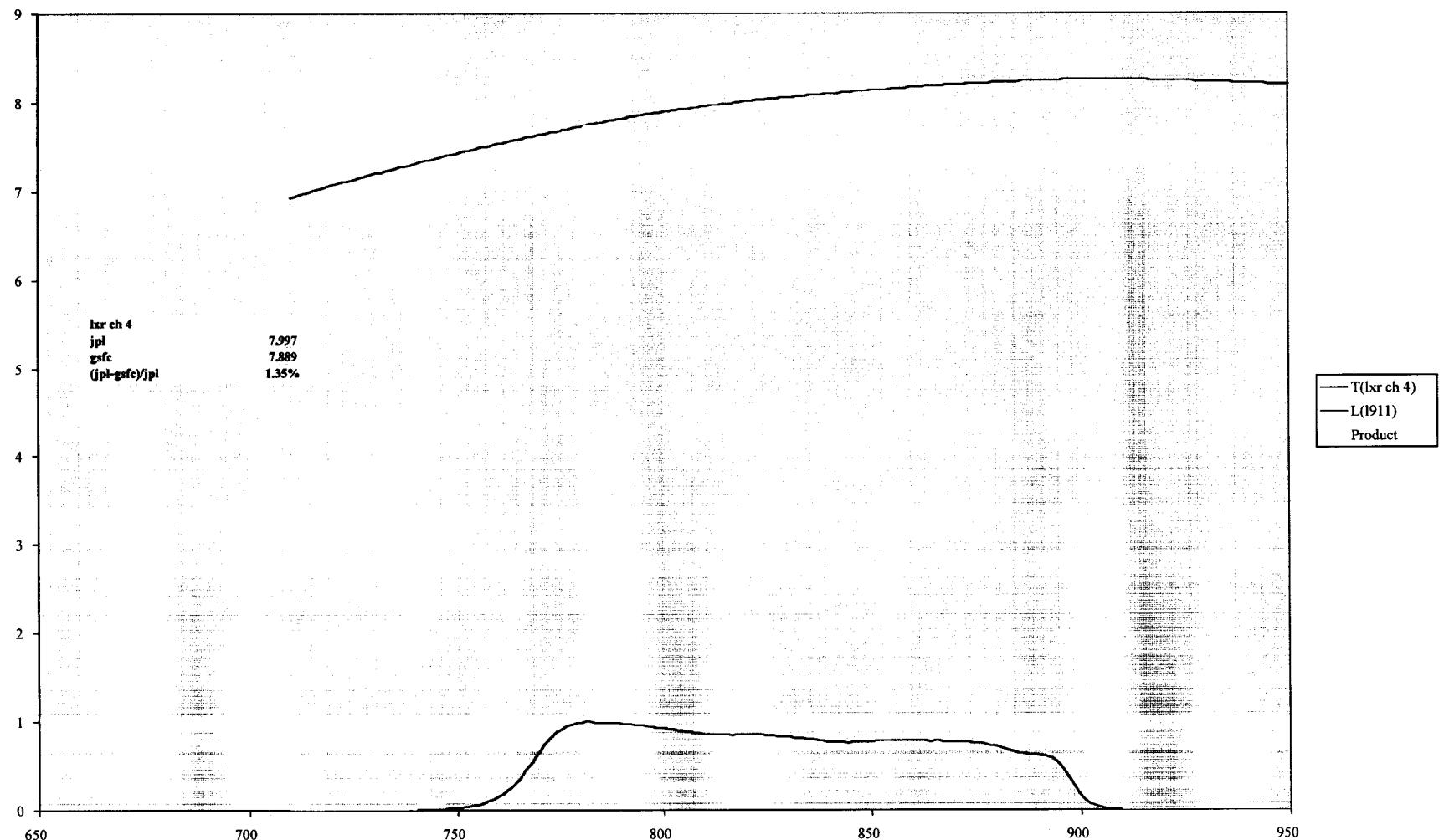
# OVERVIEW



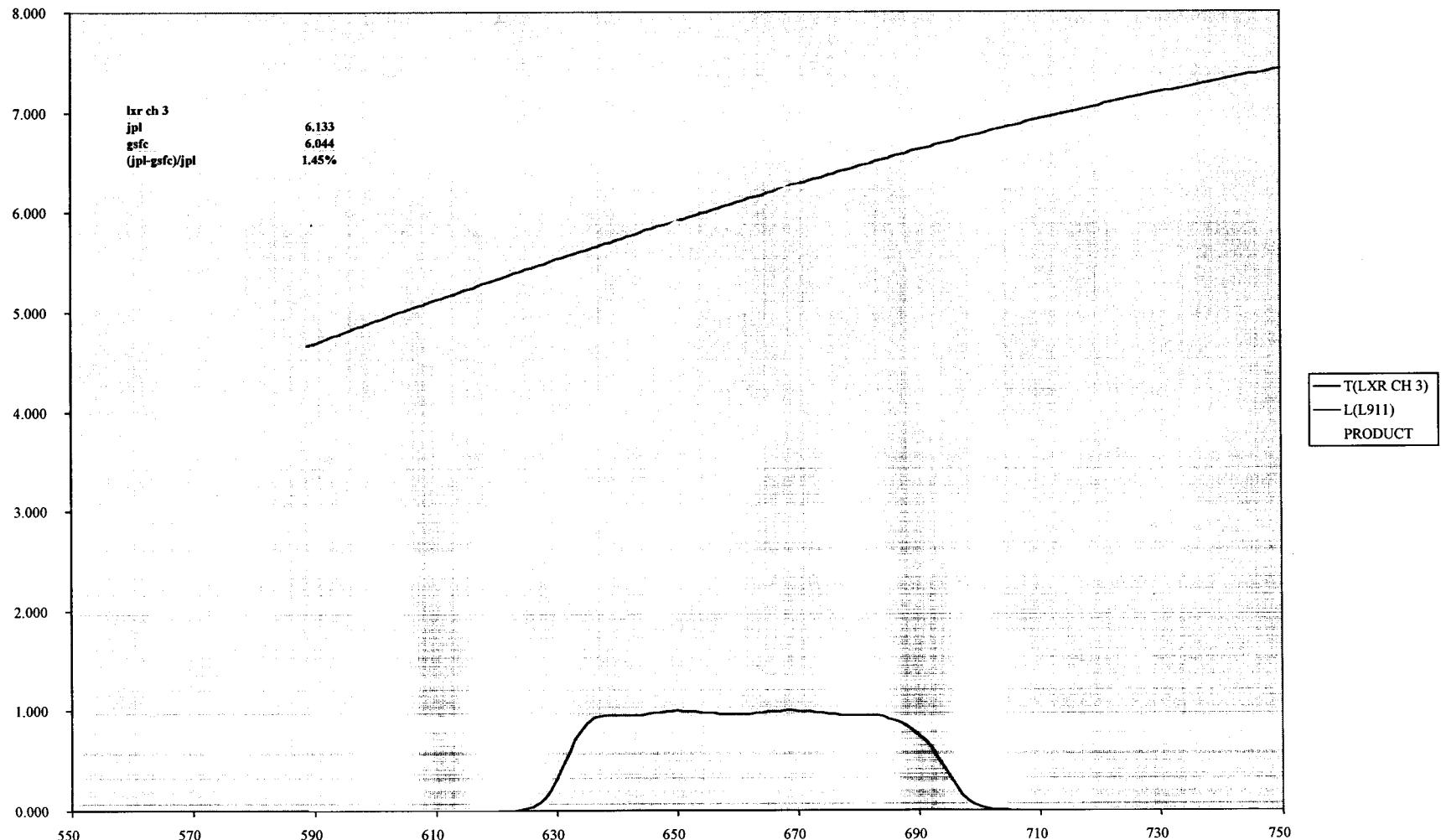
# LXR CHN 5



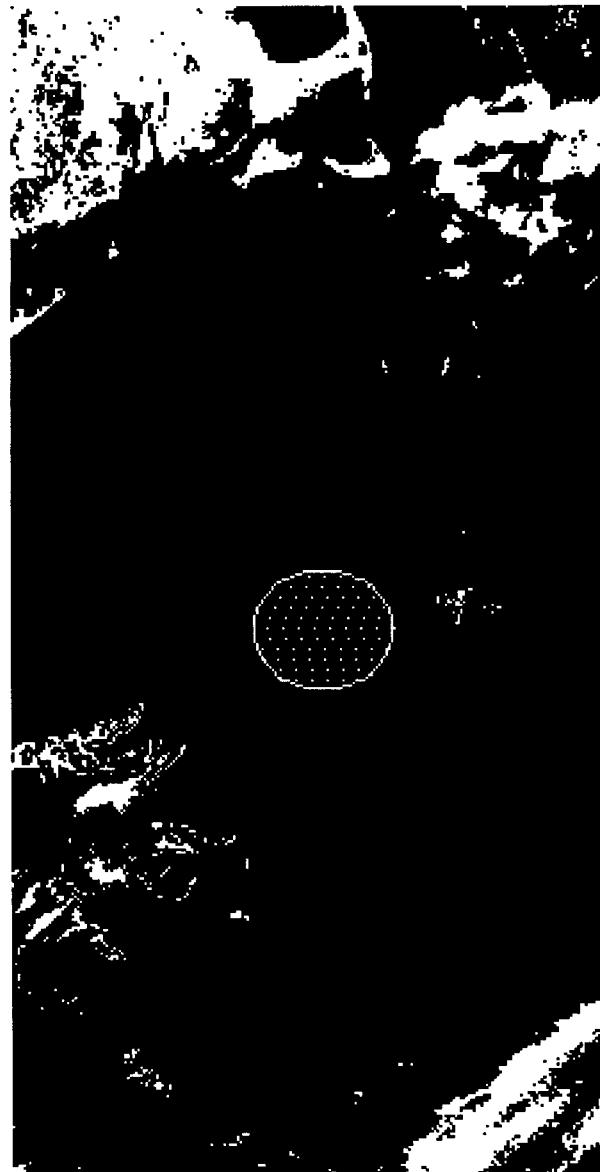
# LXR CHN 4



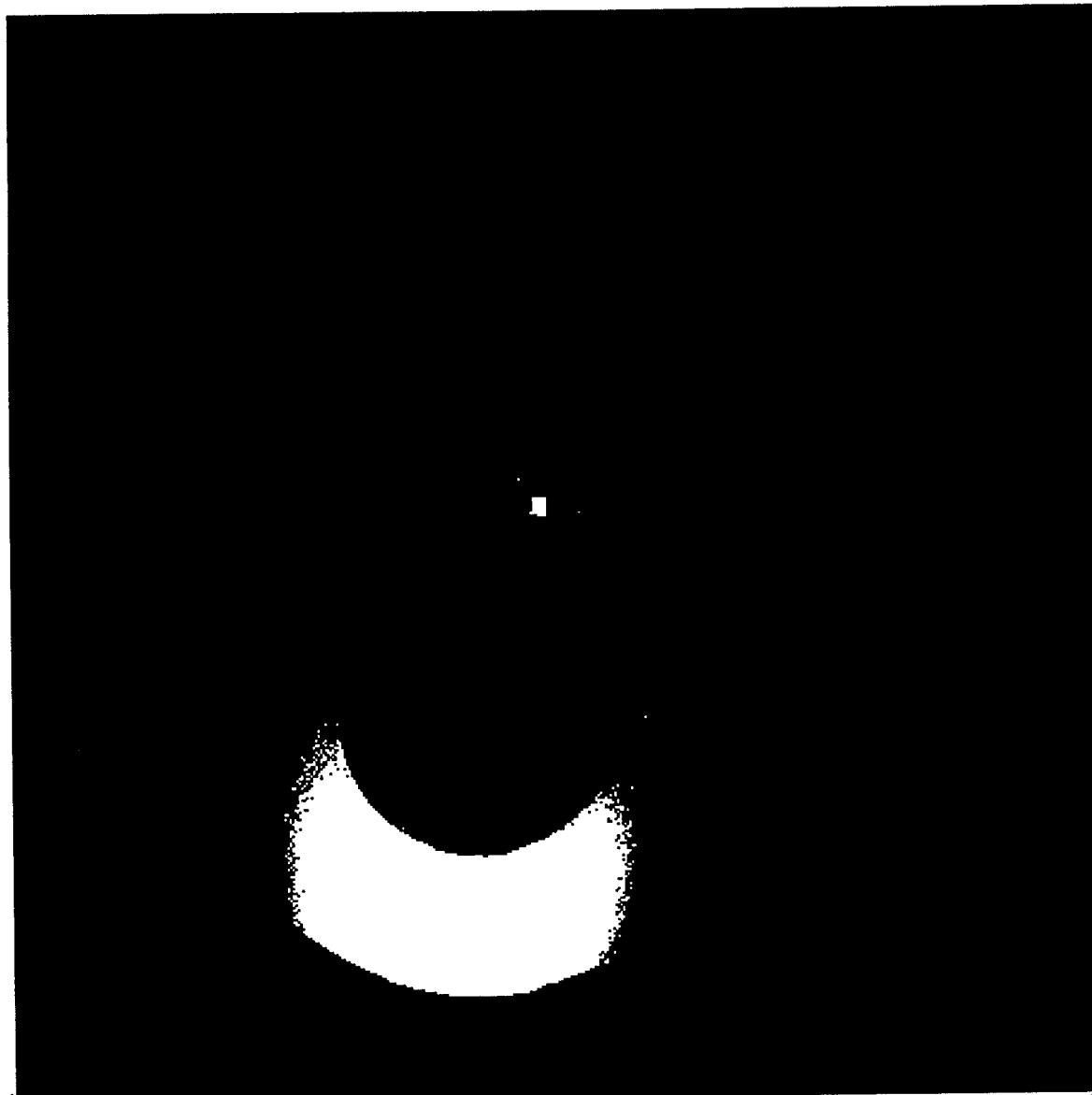
# LXR CHN 3



# SEAWIFS 990807 Data Set



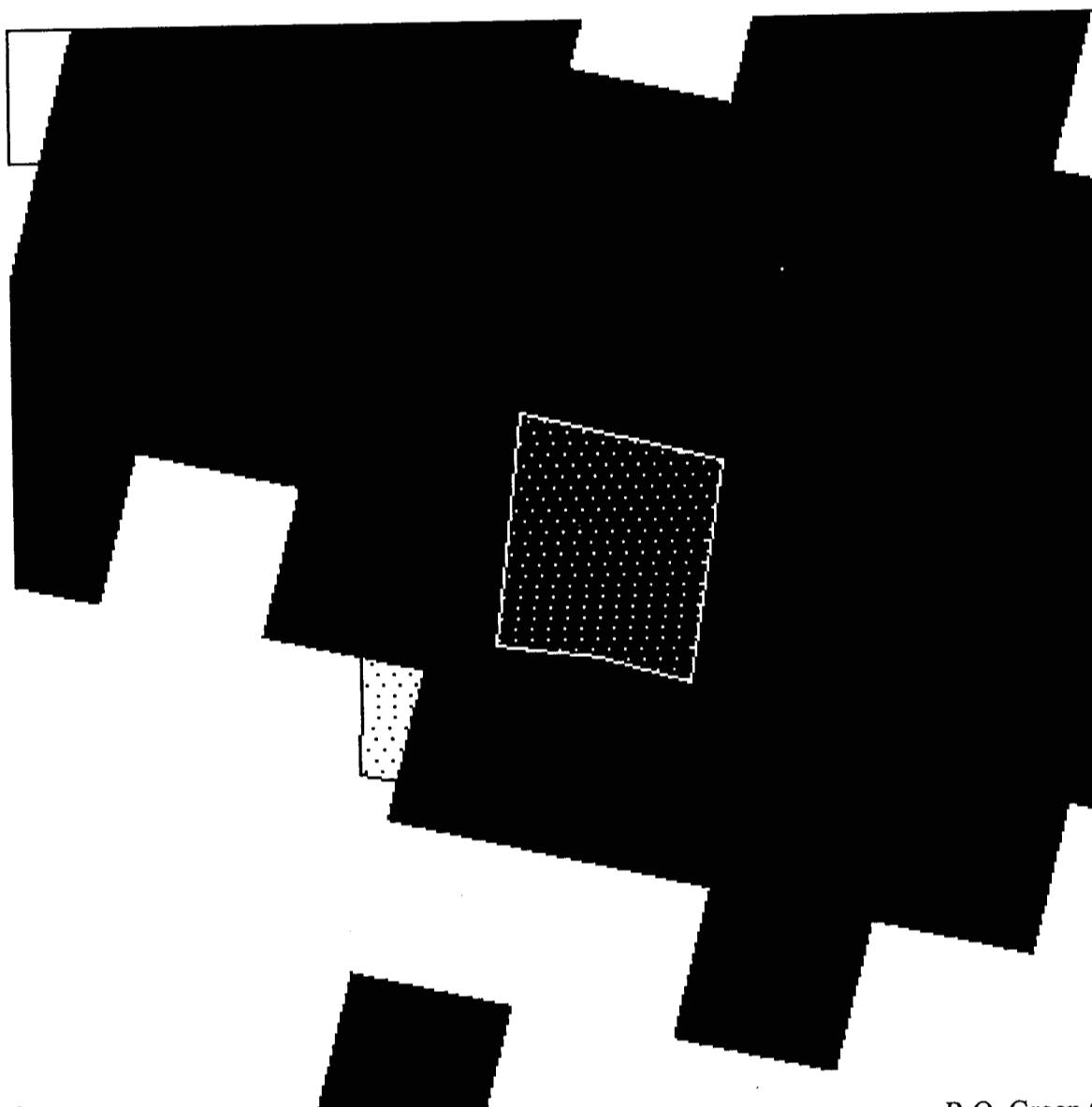
# AVIRIS Data Set, Georectified



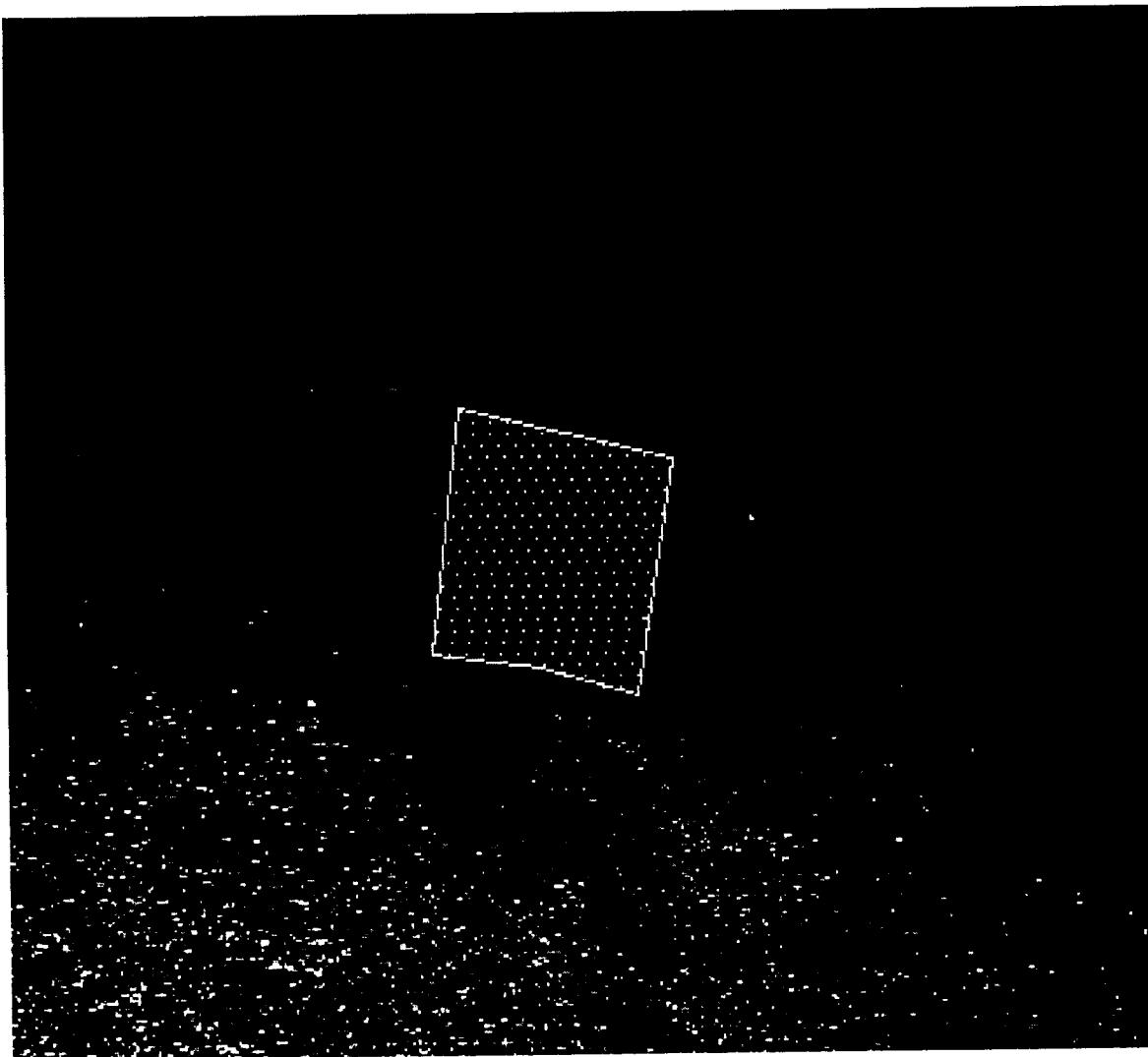
# SEAWIFS 2 and 5 degree Common Observation



# SEAWIFS Zone of Common Observation

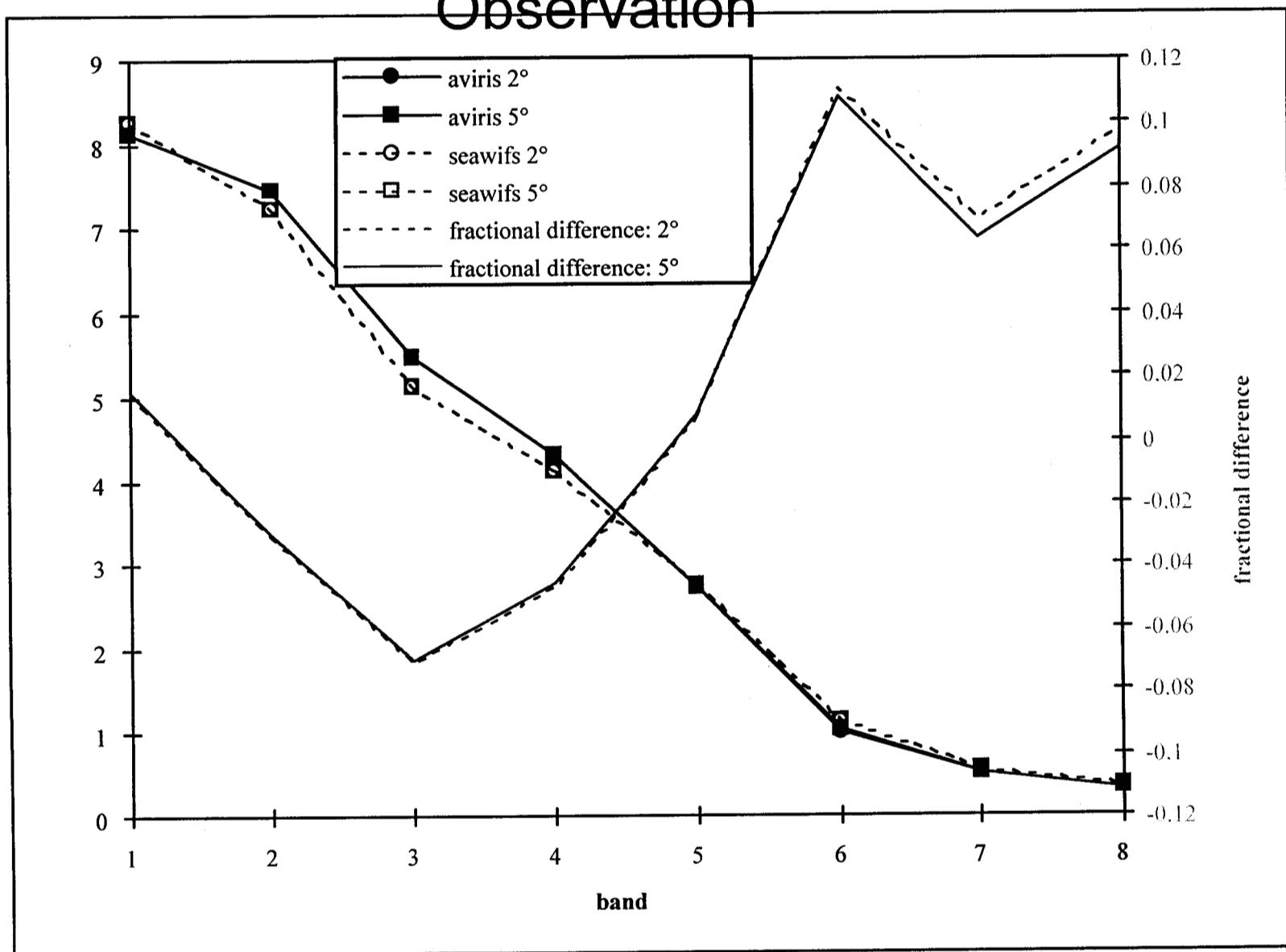


# AVIRIS 2 and 5 degree Common Observation





# Preliminary SEAWIFS and AVIRIS Common Observation



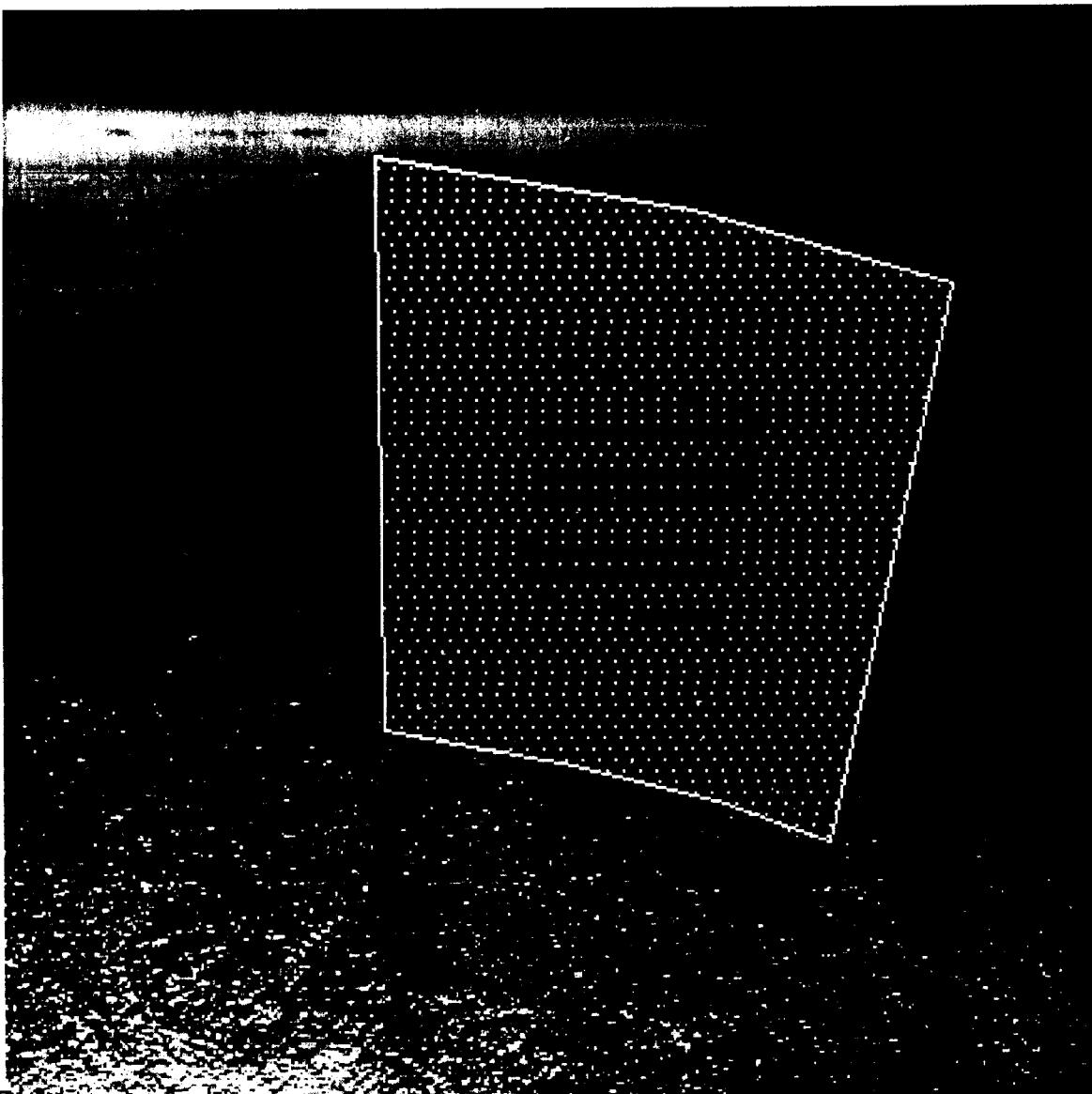
# Preliminary AVIRIS and SEAWIFS Compare

## 990807

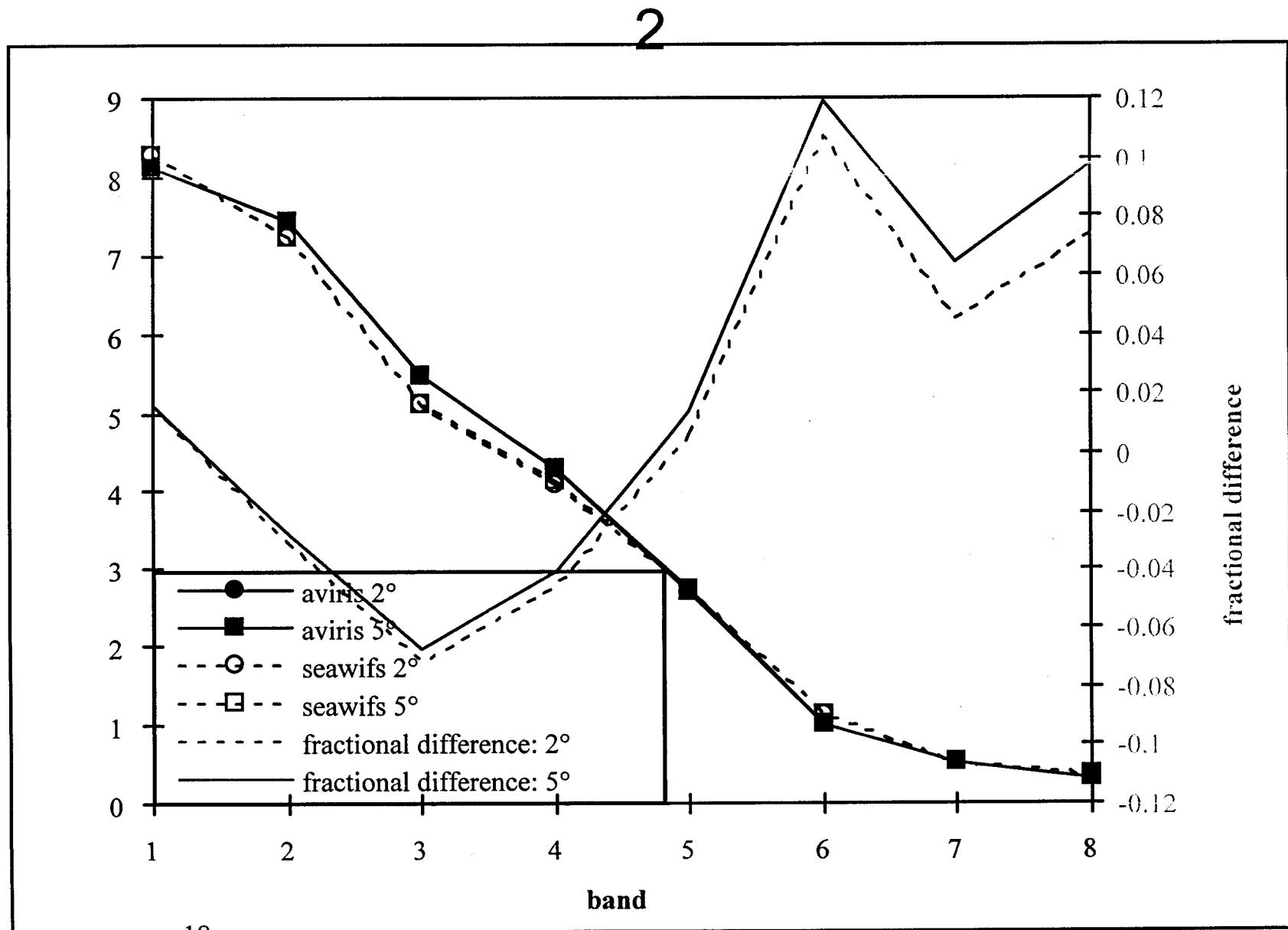
- AVIRIS circle 1 ( $\mu\text{W}/\text{cm}^2/\text{nm}/\text{ster}$ ) 990807

band	aviris 2°	aviris 5°	seawifs 2°	seawifs 5°	fractional diff 2°	fractional diff 5°
1	8.1402	8.1452	8.2575	8.2684	0.01420	0.01490
2	7.4555	7.4522	7.2321	7.2312	-0.03088	-0.03055
3	5.4870	5.4846	5.1213	5.1238	-0.07141	-0.07040
4	4.3141	4.3113	4.1201	4.1239	-0.04709	-0.04542
5	2.7290	2.7269	2.7491	2.7492	0.00730	0.00813
6	1.0046	1.0092	1.1296	1.1318	0.11069	0.10832
7	0.5032	0.5068	0.5409	0.5413	0.06972	0.06362
8	0.3117	0.3149	0.3456	0.3467	0.09805	0.09159

## AVIRIS Second Circle



# Preliminary SEAWIFS AVIRIS Comparison Circle



# SEAWIFS and AVIRIS Timing

Time	seawifs	aviris circle 1	aviris circle 2
decimal UTC	17.199144	17.071019	17.176016
hh:mm:ss UTC	17:11:57	17:04:10	17:10:34

# SEAWIFS AVIRIS Comparison 971002

BAND	SEAWIFS	AVIRIS	AVIRIS	Difference
	Radiance	Radiance	Uncertainty	
1	7.800	6.791	5.1%	12.9%
2	6.852	6.311	3.5%	7.9%
3	4.899	4.861	2.1%	0.8%
4	3.995	3.972	2.5%	0.6%
5	2.753	2.711	2.9%	1.5%
6	1.248	1.193	2.3%	4.5%
7	0.641	0.601	3.6%	6.2%
8	0.449	0.412	3.5%	8.3%

# Accomplishments and Plans

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# Discussion

- FY00 MODIS Underflight
- Plans for ADEOS II Underflights
- ...